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MOLECULAR MECHANICS OF SUBMICRON THIN MONOMERIC AND
POLYMERIC MOLECULAR FILMS(U) STATE UNIV OF NEW YORK AT
BUFFALO DEPT OF CHEMISTRY P N PRASAD 31 MAR 86

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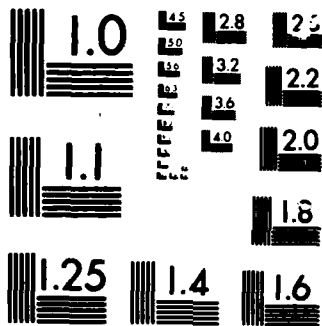
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This grant, through the DOD-University Instrumentation Program, was provided to acquire a picosecond laser system for the study of non-linear optical effects as well as for structural characterization of submicron films. The laser system consists of a CW mode-locked Nd-Yag laser (Spectra-Physics, Model 3000), the output of which, after frequency doubling, is split by a 50% beam splitter to sync pump two dye lasers (Spectra-Physics, Model 375). The outputs from these dye lasers are fed into two amplifiers (Quanta Ray, Model

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PDA) which are pumped by the second harmonic of a 20Hz pulsed Nd-Yag laser (Quanta-Ray, Model DCR-2A). The amplified pulses are 7ps wide with 0.5mJ of pulse energy. The laser system has proven to be extremely versatile and, therefore, valuable for a number of different experiments. This arrangement also gives us the choice to generate tunable picosecond u.v. and IR pulses by mixing either of two dye laser beams with the fundamental from the pulse Yag laser. FINAL REPORT, Molecular Mechanics of Submicron Thin Monomeric and Polymeric Molecular Films, AFOSR-84-0281.

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FINAL REPORT

PROJECT: Molecular Mechanics of Submicron Thin Monomeric and
Polymeric Molecular Films

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This grant, through the DOD-University Instrumentation Program, was provided to acquire a picosecond laser system for the study of non-linear optical effects as well as for structural characterization of submicron films.

First, the laser system acquired by this grant is described. The picosecond laser system is schematically shown in Figure 1. It consists of a CW mode-locked Nd-Yag laser (Spectra-Physics, Model 3000), the output of which, after frequency doubling, is split by a 50% beam splitter to sync pump two dye lasers (Spectra-Physics, Model 375). The outputs from these dye lasers are fed into two amplifiers (Quanta Ray, Model PDA) which are pumped by the second harmonic of a 20Hz pulsed Nd-Yag laser (Quanta-Ray, Model DCR-2A). The amplified pulses are 7ps wide with 0.5mJ of pulse energy. This laser system has proven to be extremely versatile and, therefore, valuable for a number of different experiments.

For degenerate four-wave mixing experiments, which probe the third-order non-linear optical effects in films, only the beam (ν) from one dye laser is used and split in three ways. For picosecond transient grating experiments, we use both beams ν_1 and ν_2 . Beam ν_1 is split in half and crossed at an angle in the sample to form the grating. Beam ν_2 , with a variable line delay, is used to diffract from the grating.

This arrangement also gives us the choice to generate tunable picosecond u.v. and IR pulses by mixing either ν_1 or ν_2 with the fundamental from the pulse Yag laser.

So far, the work completed using this instrumentation has resulted in three scientific papers. One paper has been published, the second one is in press and the third paper has just been submitted for publication. Two copies of the reprints and preprints of these works are enclosed.

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Grant funds were used to purchase a PICO II CARS laser system consisting of the following elements:

- 1 Model 3460 CW YAG Laser Head and Model 3450 Power Supply
- 1 Model 342A-08 Mode Locker System
- 2 Model 375B-81 CW Dye laser Including Model 376B Circulator, Tested and Shipped with R6G, Including 2 Plate Birefringent Filter
- 1 Model DCR-2A(30)Nd:YAG Laser (Oscillator and Amplifier, 30Hz)
- 2 Model PDA-1 Pulsed Dye Amplifier
- 1 Beam Bending Mirror Set (G0050-008-set of 2)

Total System cost was \$125,000

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